



Moritz Helmstaedter, Ph.D.

Max Planck Institute for Brain Research, Director

[Website](#) | [Contact](#)

Date Friday, March 21, 2025

Time 12:00 to 1:00 PM

Location S 105

Title: Cerebral Cortex Connectomics

Abstract: The mapping of neuronal connectivity is one of the main challenges in neuroscience. Only with the knowledge of wiring diagrams is it possible to understand the computational capacities of neuronal networks, both in the sensory periphery and especially in the mammalian cerebral cortex. Our methods for dense circuit mapping are based on 3-dimensional electron microscopy (EM) imaging of tissue, which allows imaging of nerve tissue at nanometer-scale resolution across substantial volumes, extending to more than one millimeter on the side, followed by AI-based image analysis to obtain dense connectivity maps, or connectomes. With these, we have mapped local circuitry in the mouse and human cortex, determining learning-related synaptic traces and inhibitory axonal development, and discovered an expanded interneuron-to-interneuron network in the human cortex. Most recently we completed the connectomic reconstruction of a cortical column. We are screening cortical connectomes across age, disease states, and experience to better understand their relevance to individual behavioral performance and brain pathology.

Bio: Moritz Helmstaedter is the Director at the Max Planck Institute for Brain Research in Frankfurt and a scientific member of the Max Planck Society. His work aims to push the frontiers of Connectomics, an emerging research field occupied with mapping neuronal networks in the brain at unprecedented scale and resolution. His interests lie in the relation between artificial and biological intelligence and the search for connectomic phenotypes of psychiatric disorders. Before, he was a group leader at the Max Planck Institute of Neurobiology in Munich (2011-2014).

Born in Berlin in 1978, Moritz studied medicine and physics in Heidelberg, where he also completed his doctoral thesis with Nobel laureate Bert Sakmann, and his post-doctoral work with Winfried Denk at the Max Planck Institute for Medical Research.

Additional appointments include being a professor by special appointment at Radboud University, Nijmegen, Netherlands (since 2016), a member of the Life Science Commission, National Academy Leopoldina, Germany (since 2023), a Member of the Foundation Board, Peace Prize of the German Book Trade (since 2020). Recipient of the Gottfried Wilhelm Leibniz Prize (2024).