Towards cortex-wide volumetric recording of neuroactivity at cellular resolution

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Understanding how sensory information is represented, processed and leads to generation of complex behavior is the major goal of systems neuroscience. However, the ability to detect and manipulate such large-scale functional circuits has been hampered by the lack of appropriate tools and methods that allow parallel and spatiotemporally specific manipulation of neuronal population activity while capturing the dynamic activity of the entire network at high spatial and temporal resolutions.

A central focus of our lab is the development and application of new optics-based neurotechnologies for large-scale, high-speed, and single-cell resolution interrogation of neuroactivity across model systems. Through these, we have consistently pushed the limits on speed, volume size, and depth at which neuronal population activity can be optically recorded at cellular resolution. Amongst others have demonstrated whole-brain recording of neuroactivity at cellular resolution in small model systems as well as more recently near-simultaneous recording from over 1 million neurons distributed across both hemispheres and different layers of the mouse cortex at cellular resolution.

I will present on our efforts on neurotechnology development and how the application of some of these optical neurotechnologies could enable solving a qualitatively new range of neurobiological questions that are beyond reach of current methods. Ultimately, our aim is to uncover some of the computational principles underlying representation of sensory information at different levels, its processing across the mammalian brain, and how its interaction with internal states generates behavior.

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In-Person

Max Planck Institute for Neurobiology of Behavior – caesar, Lecture Hall,
Ludwig-Erhard-Allee 2, 53175 Bonn

Online

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Meeting-ID:
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Neuroscience Seminar Series