

# Research Project Function of Sleep in Shaping Neural Circuitry

## Third-party funded project

Project title Function of Sleep in Shaping Neural Circuitry

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#### Organisation / Research unit

Institute of Molecular and Clinical Ophthalmology Basel (IOB) / Research Group Keller IOB

## Department

Project Website https://iob.ch/research/molecular-research-center/visual-cortex-plasticity- group-andreas-keller

Project start 01.01.2021 Probable end 31.12.2025

#### Status Active

Throughout life, we learn, experience, and discover. Our brain integrates this wealth of ever-changing information in a model of the world. This challenging task requires long-term changes in neuronal circuits that should not interfere with already stored memories or with ongoing processing. To minimize interference, it has long been speculated that the coordination of the integration of new memories involves global brain-state changes as they occur e.g. during sleep. Whether this gating of plasticity is implemented through global brain-state changes and, if so, what the underlying mechanisms are remains largely unclear. One brain structure which continuously processes sensory information, but is fundamentally reshaped by experience, even in adult animals, is sensory cortex. It is increasingly clear that activity in sensory cortex is driven both by feedforward input as well as context-dependent feedback signals. Both these pathways are shaped by experience without overtly interfering with cortex-dependent visualguided behaviors, preserving a stable representation of the world. The aim of this research is to uncover the mechanisms that gate plasticity to shape cortical circuits during learning, while maintaining normal brain function. This will involve research on neuronal circuits, the development of novel technologies for the chronic manipulation and recording of neuronal activity, and of strategies for targeted interventions that enhance plasticity.

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