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マウス大脳皮質視覚野における投射領野特異的な皮質間情報伝達のメカニズム

Mechanisms of target-specific cortico-cortical transformations in the mouse visual system

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The processing of visual information is initiated in rod and cone photoreceptors when photoreceptors capture photons, convert them into electrical signals, and stimulate multiple neural circuits in the retina. The lateral geniculate nucleus (LGN) is the primary relay center for visual information received from the retina. The LGN neurons send their axons to the primary visual cortex V1, which extracts simple local visual features, such as orientations and edges. The V1 sends its output to a hierarchical series of extrastriate visual areas, which represent a variety of higher order visual features, including motion, depth perception, image segmentation and object recognition. These visual information processing pathways are mediated by glutamatergic transmission.

The Visual information processing is achieved by the hierarchical organization of the visual cortex. Mouse visual cortex consists of a primary visual area (V1) and at least nine higher-order visual areas (HVAs) which are functionally tuned to specific visual features. The functional specialization of HVAs can arise from the interaction between V1 and HVAs. Thus, revealing how information flows between V1 and HVAs is pivotal in understanding the mechanisms of visual perception. However, how HVA-projecting V1 neurons integrate information from their presynaptic neurons and send the information to the target HVA remains unknown. We have tackled this question by developing our own viral and imaging approaches. In this talk, I will present our recent data regarding the mechanisms of target-specific cortico-cortical transformations in the mouse visual system.