"Parallel Geniculocortical Pathways and Local Circuits in Visual Cortex"

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Date: Friday, November 25th, 2005
Time: 3-6pm
Place: 2nd Floor Seminar Room, School of Health and Sport Sciences, Osaka University Toyonaka Campus
Host: Ichiro Fujita
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All are welcome to attend!
There will be a party after the seminar.

Abstract
We have studied primary visual cortex (V1) to better understand how neural circuits give rise to perception. We have found that cortical circuits are extremely precise, such that different neuron types with overlapping dendrites, and even neighboring neurons of the same type, are connected differently. This fine-scale and cell type-specific organization implies that studies of relationships between circuits and function should match this level of organization. We have exploited differences in the laminar projections within V1 of different types LGN neurons to correlate these cell types with their functional properties. We find that red-green and blue-yellow color opponent LGN neurons comprise parallel pathways that project to different layers of V1, and neurons with blue-on versus blue-off receptive fields project to distinct zones. Using rabies virus as a retrograde transynaptic tracer, we have followed these pathways into higher extrastriate cortical areas. We find that V1 neurons projecting to higher areas, including the visual motion area MT, receive convergent input from the earlier, parallel magno-, parvo-, and koniocellular visual pathways. To test hypotheses about contributions of specific cell types to neuronal responses and to perception, we have developed methods to allow reversible inactivation of selected cell types in primates. We find that expression of an insect neuropeptide receptor which couples to GIRK channels can be used to selectively, quickly, and reversibly eliminate the activity of LGN or cortical neurons in vivo. Future application of these methods will allow in vivo tests of the role of particular cell types within the functioning cortical network.