Speaker: John H. Reynolds, PhD, Salk Institute
Time: 4pm, Departmental Tea immediately following.
Date: Friday, 23 February 2007
Place: BCS Auditorium, 46-3002
Title: Attention-dependent response modulation varies across cell classes in visual area V4

Abstract:
Cortical neurons differ from one another in important ways, including their neurochemical properties, patterns of connectivity, laminar distribution, gene expression patterns and developmental origin. Previous studies of attention have not sought to distinguish among different classes of neurons. We therefore know almost nothing about the complex circuitry that transforms attentional feedback signals into improved visual processing. Studies in the slice and in anesthetized animals find that parvalbumin expressing GABA-ergic interneurons with the morphologies of basket and chandelier cells have short duration action potentials, whereas most excitatory cell classes have longer duration action potentials, a difference that is due to expression of different classes of sodium and potassium channels. We have examined differences in attentional modulation across visual area V4 neurons classified on the basis of action potential width. The distribution of action potential widths in our sample of 179 neurons was clearly bimodal. Broad spiking neurons made up ~80% of our sample and exhibited markedly lower levels of spontaneous activity and weaker stimulus-evoked responses than narrow spiking neurons. Narrow spiking neurons showed a median increase in firing rate that was more than five times larger than the increase that was observed among broad spiking neurons. Attention also reduced response variability, as measured by the Fano factor. This reduction was significantly greater among narrow than broad spiking neurons. We also examined the spike-field coherence (SFC), a measure of response synchronization. Consistent with earlier studies, we find that high frequency SFC is increased with attention, but this increase was observed only for narrow spiking neurons. Both classes of cells showed significant attention-dependent reductions in low frequency SFC. These findings lead to the conclusion that attention has a pronounced influence on local inhibitory interneurons.

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