Latency of inhibition from inside and outside the classical receptive field in macaque V1 neurons

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INTRODUCTION

The response of a neuron to an optimal stimulus in its classical receptive field (CRF) can be modulated by two well-known effects: surround suppression and cross-orientation inhibition. Some researchers have proposed that cortical mechanisms underlie these suppression effects (Engel, 1996) while others have suggested separate mechanisms (Engel et al., 1996). We used a novel stimulus to probe the temporal dynamics of both phenomena and found that on average surround suppression occurs substantially later than the suppression caused by cross-orientation inhibition.

METHODS

We recorded extracellularly from neurons in primary visual cortex (V1) in anesthetized, paralyzed monkeys. To study these two types of suppression, we simultaneously stimulated the CRF and the surround with separate drifting gratings which changed randomly and independently between two states, C+ and C-, and S+ and S-. The latencies of inhibition from inside and outside the CRF were measured from the time of state transition (in bold) matches that for C+ alone (in light) for a time, but then diverges.

DISCUSSION

Our results indicate that suppression within the CRF occurs at the same time as CRF excitation, suggesting that the two are not strictly separated. Suppression from the surround has been shown to vary over a wide range of spatial frequencies and temporal frequencies. As we vary the spatial frequency of the stimulus, the latency of inhibition from outside the CRF changes, suggesting that the suppression occurs at the same time as the CRF excitation.

REFERENCES