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The frontal eye field sends predictively remapped visual signals to the superior colliculus

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Abstract

We perceive a stable visual world even though saccades often move our retinas. One way the brain may achieve a stable visual percept is through predictive remapping of visual receptive fields: just before a saccade, the receptive field of many neurons moves from its current location ("current receptive field") to the location it is expected to occupy after the saccade ("future receptive field"). Goldberg and colleagues found such remapping in cortical areas, e.g. in the frontal eye field (FEF), as well as in the intermediate layers of the superior colliculus (SC). In the present study we investigated the source of the SC's remapped visual signals. Do some of them come from the FEF? We identified FEF neurons that project to the SC using antidromic stimulation. For neurons with a visual response, we tested whether the receptive field shifted just prior to making a saccade. Saccadic amplitudes were chosen to be as small as possible while clearly separating the current and future receptive fields; they ranged from 5–30 deg. in amplitude and were directed contraversively. The saccadic target was a small red spot. We probed visual responsiveness at the current and future receptive field locations using a white spot flashed at various times before or after the saccade. Predictive remapping was indicated by a visual response to a probe flashed in the future receptive field just before the saccade began. We found that many FEF neurons projecting to the SC exhibited predictive remapping. Moreover, the remapping was

as fast and strong as any previously reported for FEF or SC. It is clear, therefore, that remapped visual signals are sent from FEF to SC, providing direct evidence that the FEF is one source of the SC's remapped visual signals. Because remapping requires information about an imminent saccade, we hypothesize that remapping in FEF depends on corollary discharge signals such as those ascending from the SC through MD thalamus (Sommer and Wurtz 2002).

Sommer, M. A., Wurtz, R. H.(2003). The frontal eye field sends predictively remapped visual signals to the superior colliculus [Abstract]. *Journal of Vision*, 3(9): 146, 146a, <http://journalofvision.org/3/9/146/>, doi:10.1167/3.9.146. [[CrossRef](#)] [[PubMed](#)]

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