Eye Movements Temporarily Organize Spatial Representations in the Primate Hippocampus

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Conclusions
- Single unit recordings in the rodent hippocampus have revealed place cells (O’Keefe, 1971) and time cells (MacDonald et al., 2011; Pastalkova et al., 2008) that are hypothesized to support the spatial and temporal aspects of episodic memories.
- Neurons recorded in the primate hippocampus selectively respond when a monkey views portions of an environment, independent of the monkey’s physical position (Rolls et al., 1997).
- Recent work in our lab identified visual grid cells in the primate entorhinal cortex which responded in a grid-like pattern reflecting gaze location during the free-viewing of images (Rolls et al., 2012).
- Building upon this recent work, we recorded from 347 neurons in the hippocampus of 2 monkeys during the free-viewing of images and a directed eye movement task.
- Here we analyzed the spatial, temporal, and contextual properties of these hippocampal neurons.

Introduction
- Methods
  - Free Viewing
  - Directed Eye Movement Task
  - Visual Place Cells
  - Eye Movement Responses
  - Stimulus Responses
  - Visual Place Cells Show Contextual Modulation
  - Eye Movements Temporarily Organize Visual Place Cells
  - Saccade-Direction Modulation is also Temporally Organized

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Using Eye Movements to Build Spatial Relationships

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Eye Movement Responses

Stimulus Responses