

# View Cells in the Primate Hippocampus during Visual Exploration are Temporally Organized



UNIVERSITY of WASHINGTON

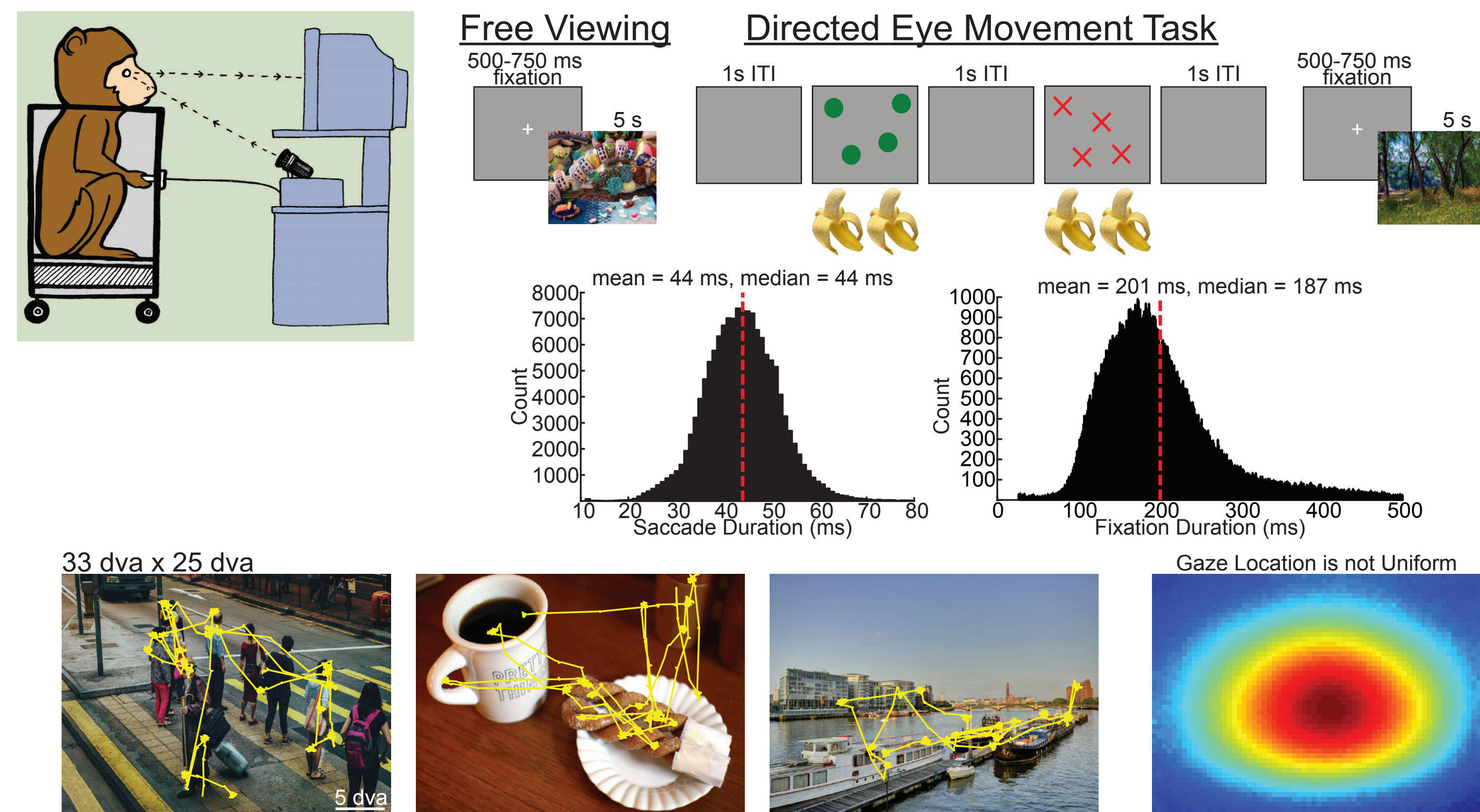
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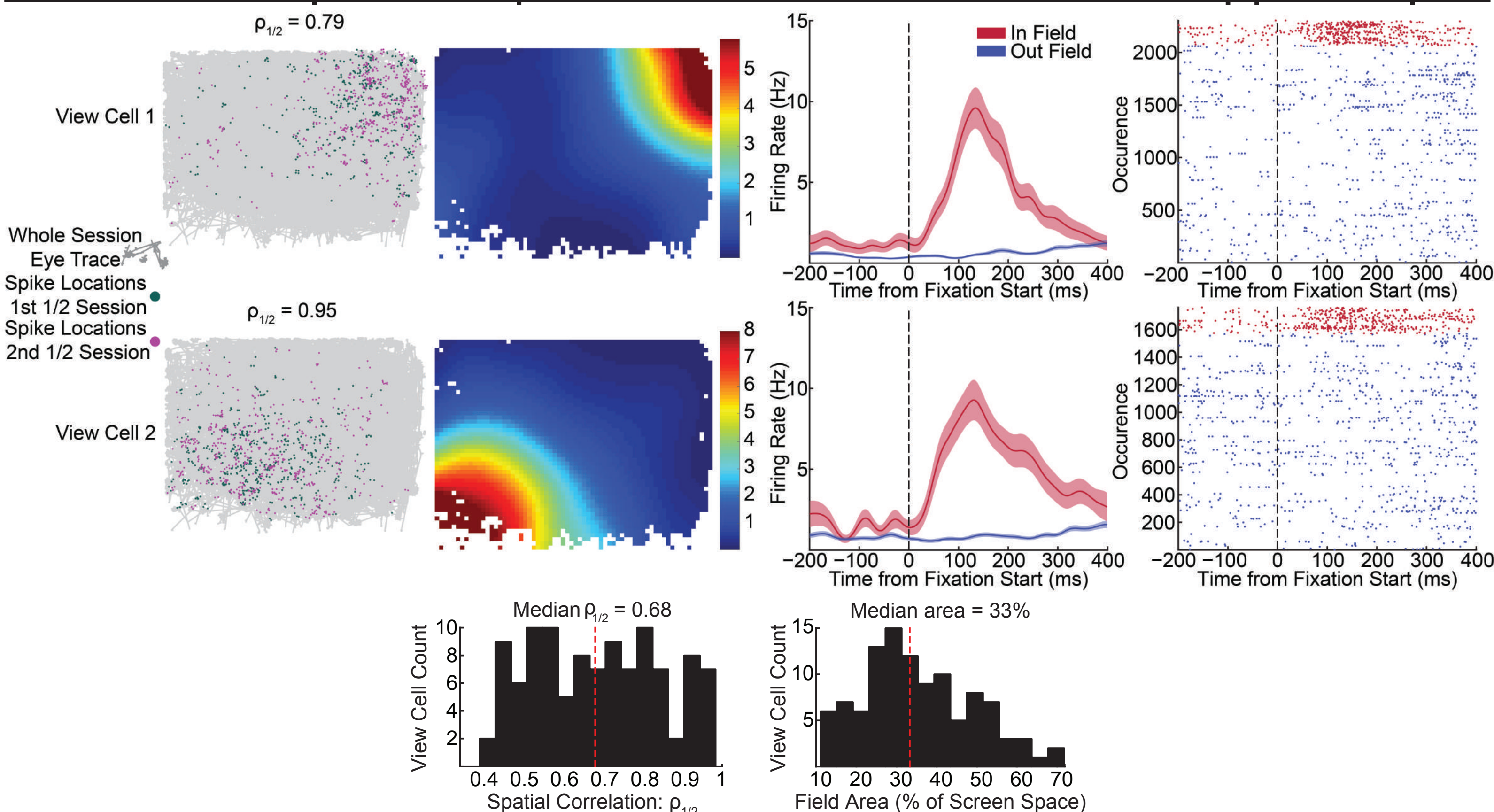
## Introduction

- Single unit recordings in rodents have revealed place cells (O'Keefe, 1971) and time cells (MacDonald et al., 2011; Pastalkova et al., 2008) in the hippocampus that are hypothesized to support the spatial and temporal aspects of episodic memories.
- Rolls and colleagues (1997) identified neurons in the primate hippocampus that responded selectively when a monkey viewed portions of the environment, independent of the monkey's physical position.
- 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 (Killian, Jutras, and Buffalo, 2012).
- Building on our recent work, we recorded from 347 neurons in the primate hippocampus during the free-viewing of images and identified spatial representations in 31% of these neurons (107/347) neurons.

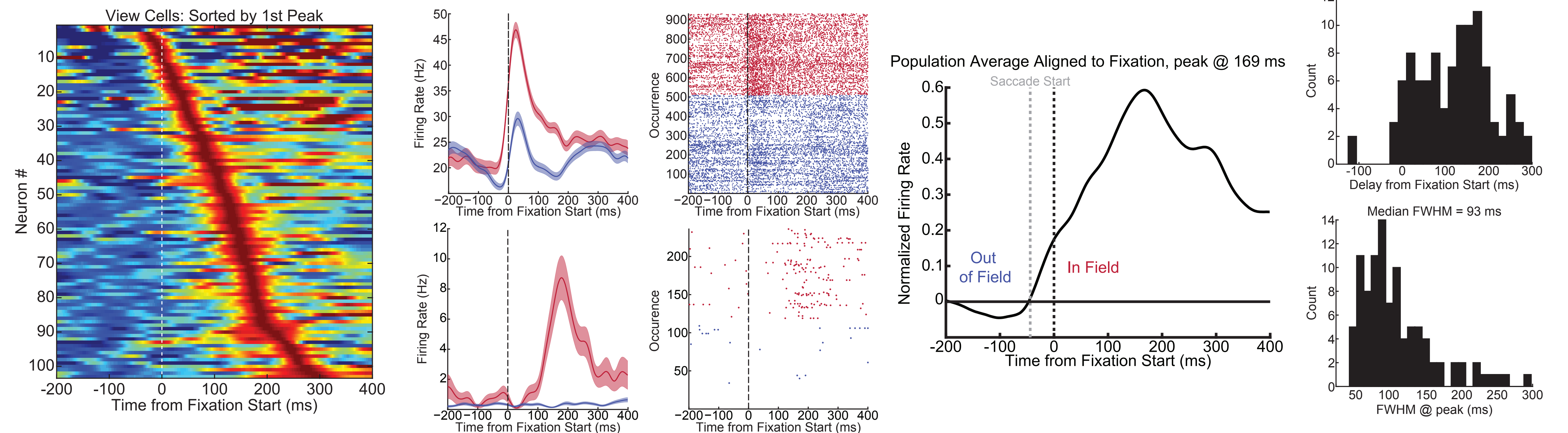
## Experimental Setup



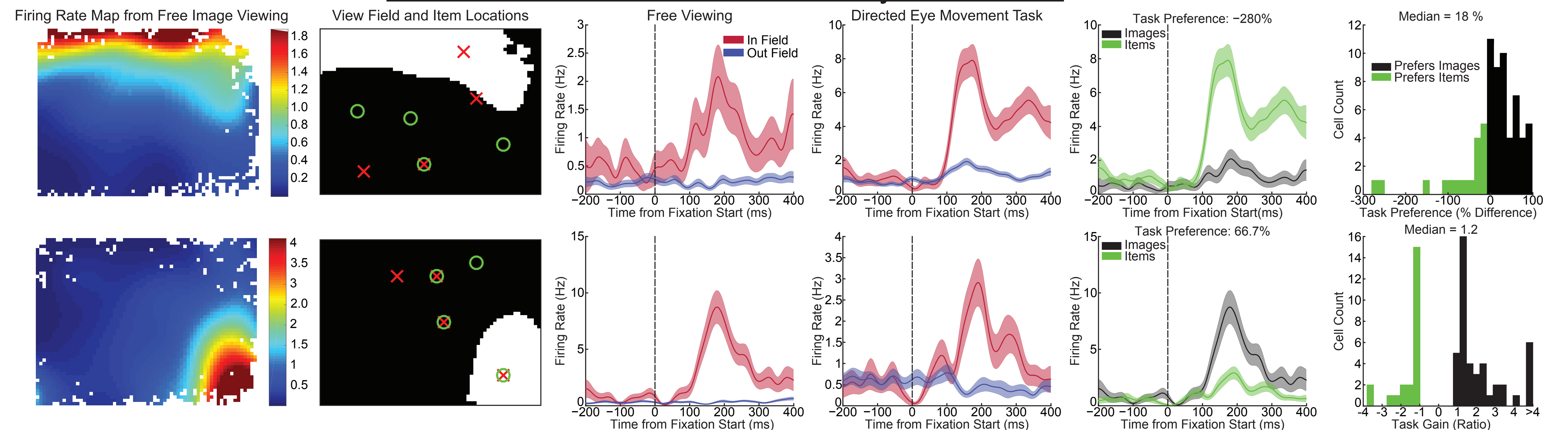
## View Cells: Spatial Representations in the Primate Hippocampus



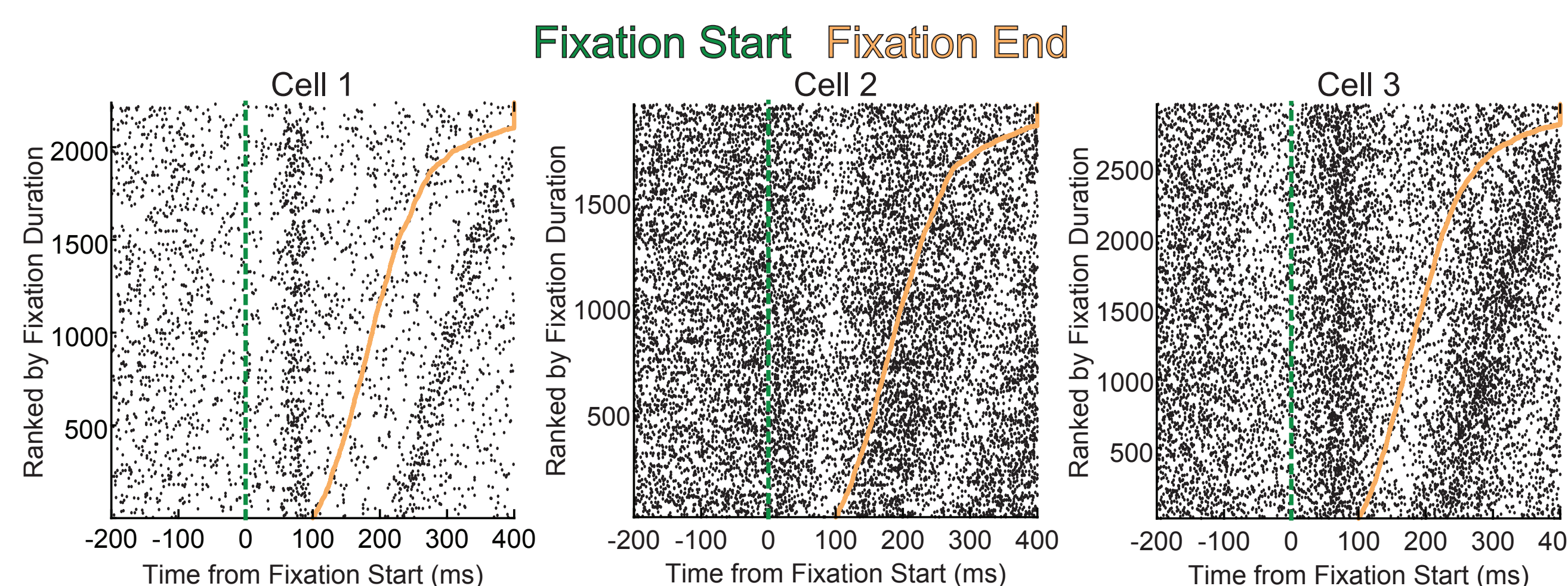
## View Cells are Temporally Organized around Eye Movements



## Some View Cells are Contextually Modulated



## Many Neurons Are Temporally Organized around Eye Movements



## Conclusions

- Here, we identified a significant proportion of neurons in the monkey hippocampus that responded selectively when the monkey fixated particular locations on the computer monitor during a free-viewing task.
- These neurons additionally demonstrated temporal specificity, in that they responded at a particular time relative to fixation onset. Across the population, the full range of time within each fixation was represented.
- Some spatially-selective neurons demonstrated modulation in activity across different tasks.
- Future studies, including large, simultaneous recordings across the hippocampus are necessary to establish the presence of temporal sequences relative to eye movements.

## Acknowledgments

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