

MEMORY CODING PROPERTIES OF PREFRONTAL CORTICAL NEURONS IN THE RAT

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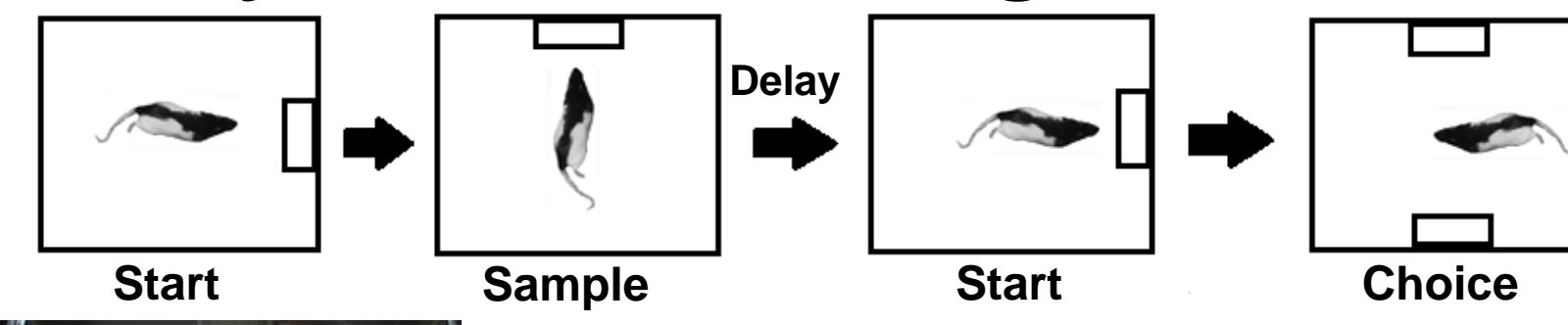
BACKGROUND

- The prefrontal cortex (PFC) is responsible for holding information relevant to a given task online so that it may be used or manipulated (Working Memory).
- Working memory is required for successful completion of the DNMTF paradigm employed in this project.
- The goal of this project was to acquire and analyze extracellular recordings from rats performing a DNMTF task in order to characterize the coding properties of prefrontal cells at various levels of cortex.

METHODS

TASK

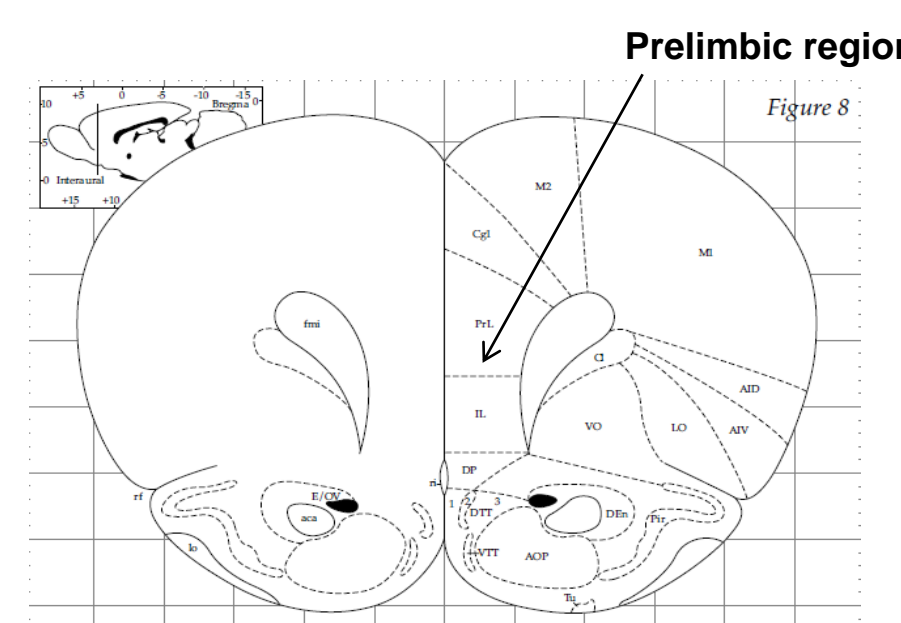
Delayed Non Matching to Position



- Start: one lever at random is extended
- Sample: lever to the right or left is extended, initiating delay period.
- Choice: both levers to right and left of the start lever extended

SURGERY

- Custom built tetrode arrays were implanted in Prelimbic region of PFC.



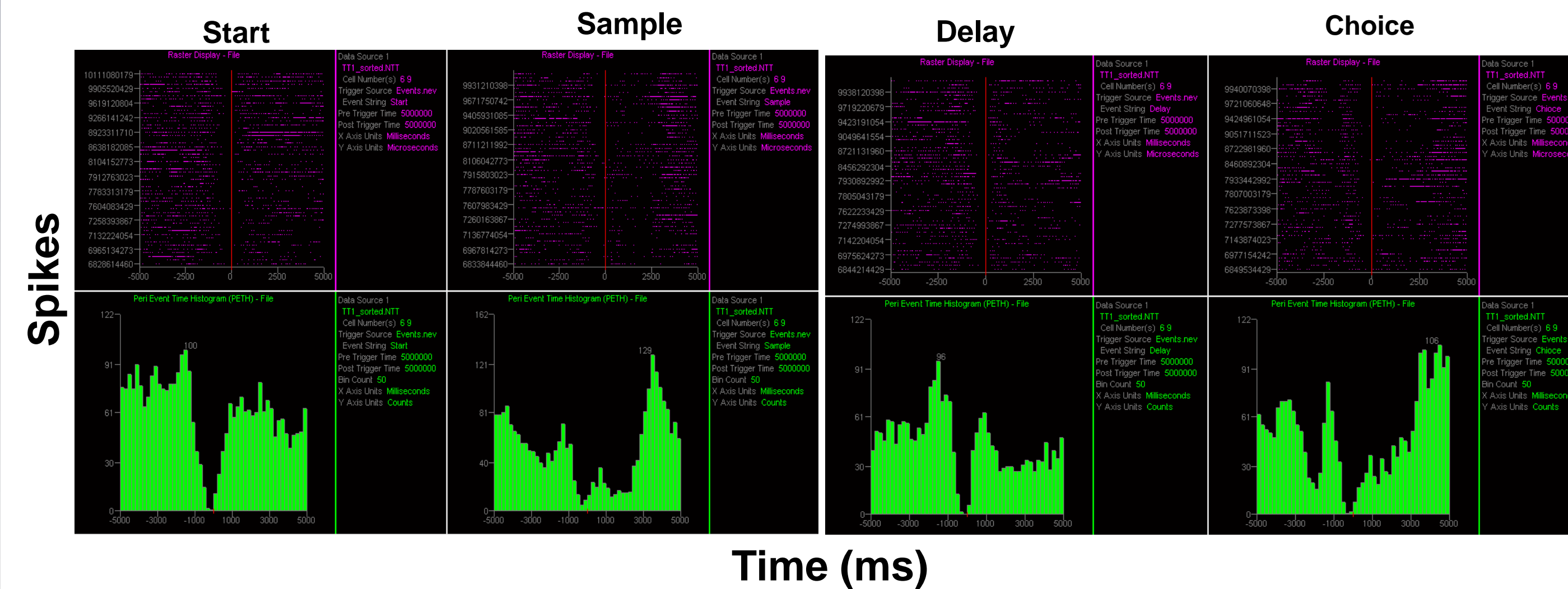
RECORDING

- Extracellular recordings were acquired using the Neuralynx Digital Lynx SX system

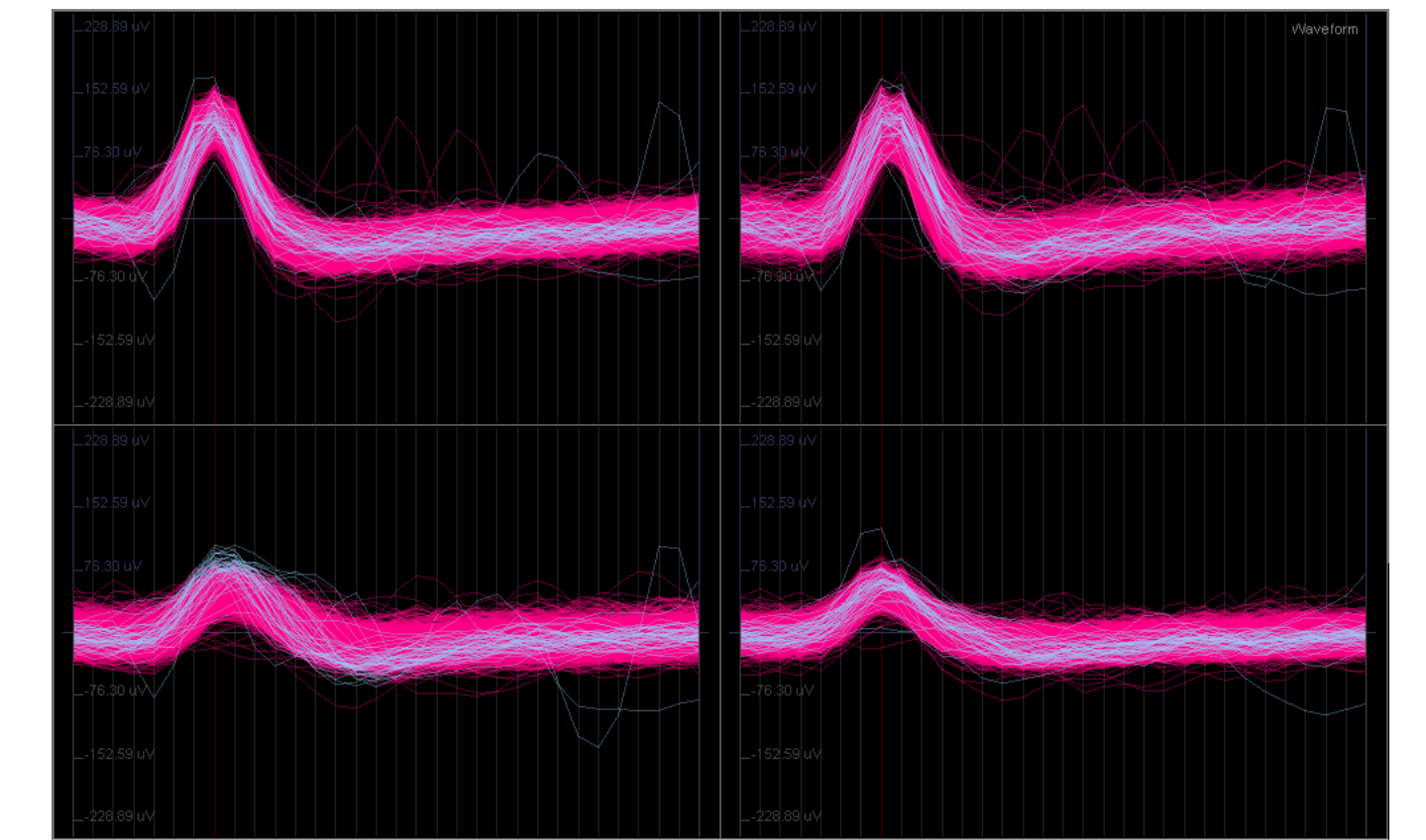


RESULTS: EXAMPLES

“MOTOR PLANNING” CELL

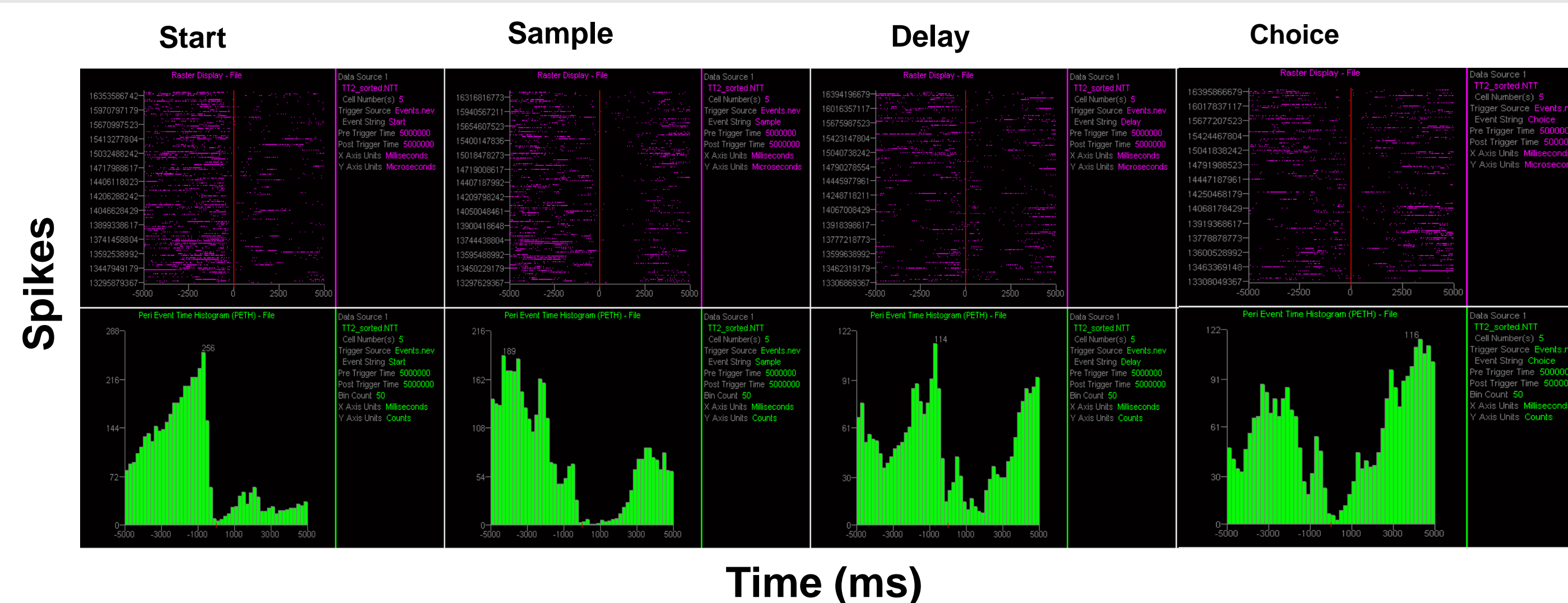


Activity increased as the animal moved throughout the task, and diminished once the animal reached the target.

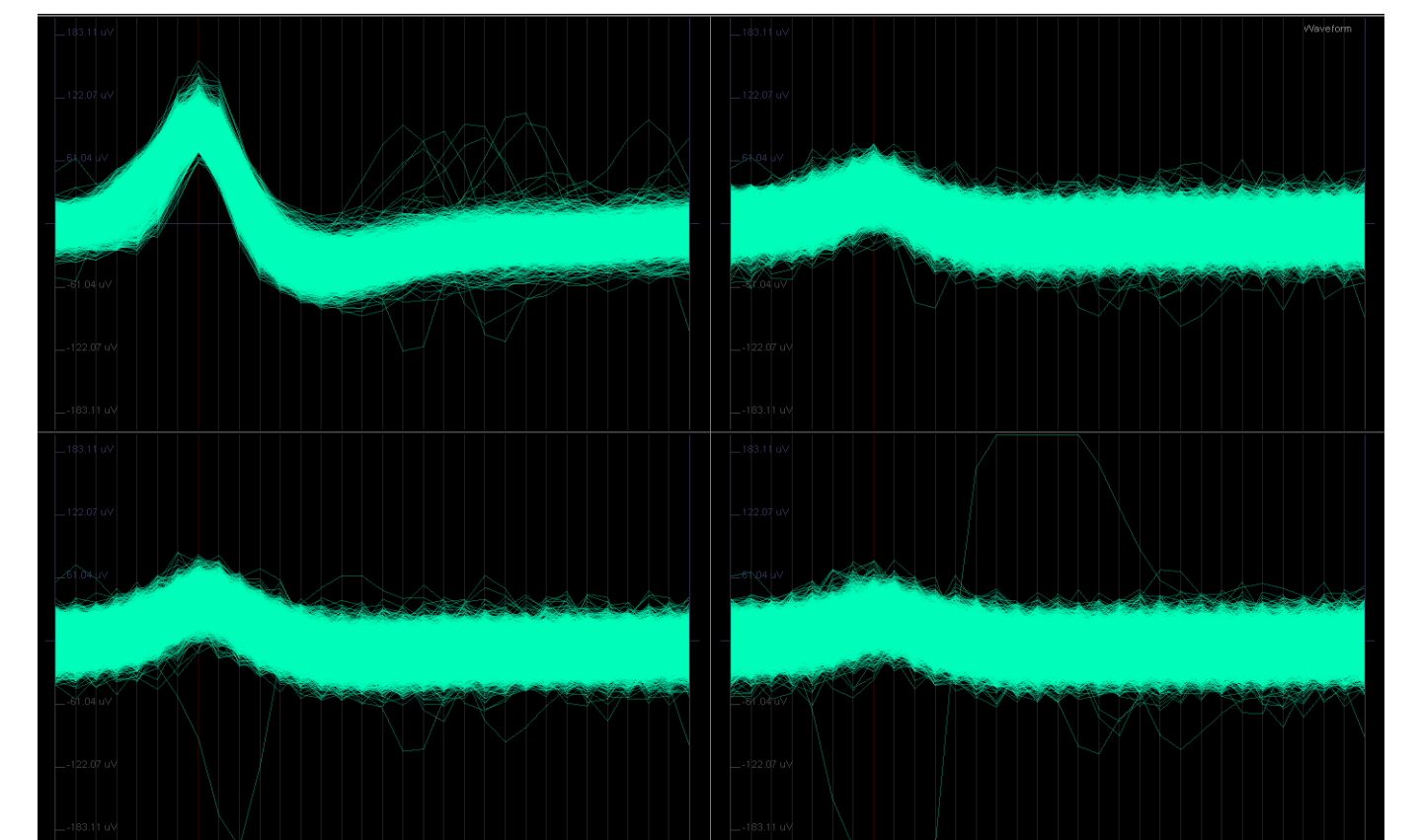


Motor Planning Cell Waveforms

“GET-READY” CELL

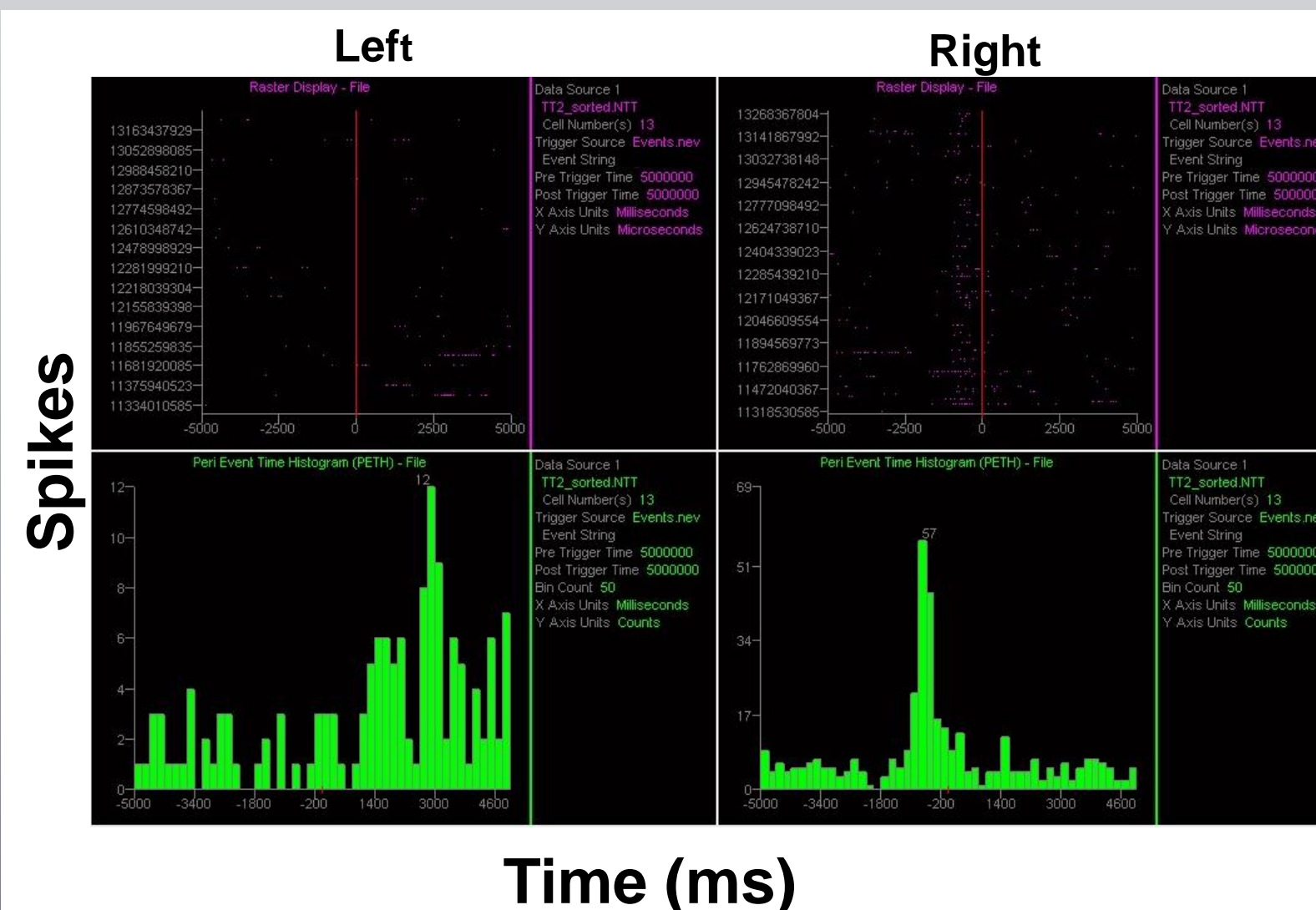


An increase in activity was observed just before the start of each trial.



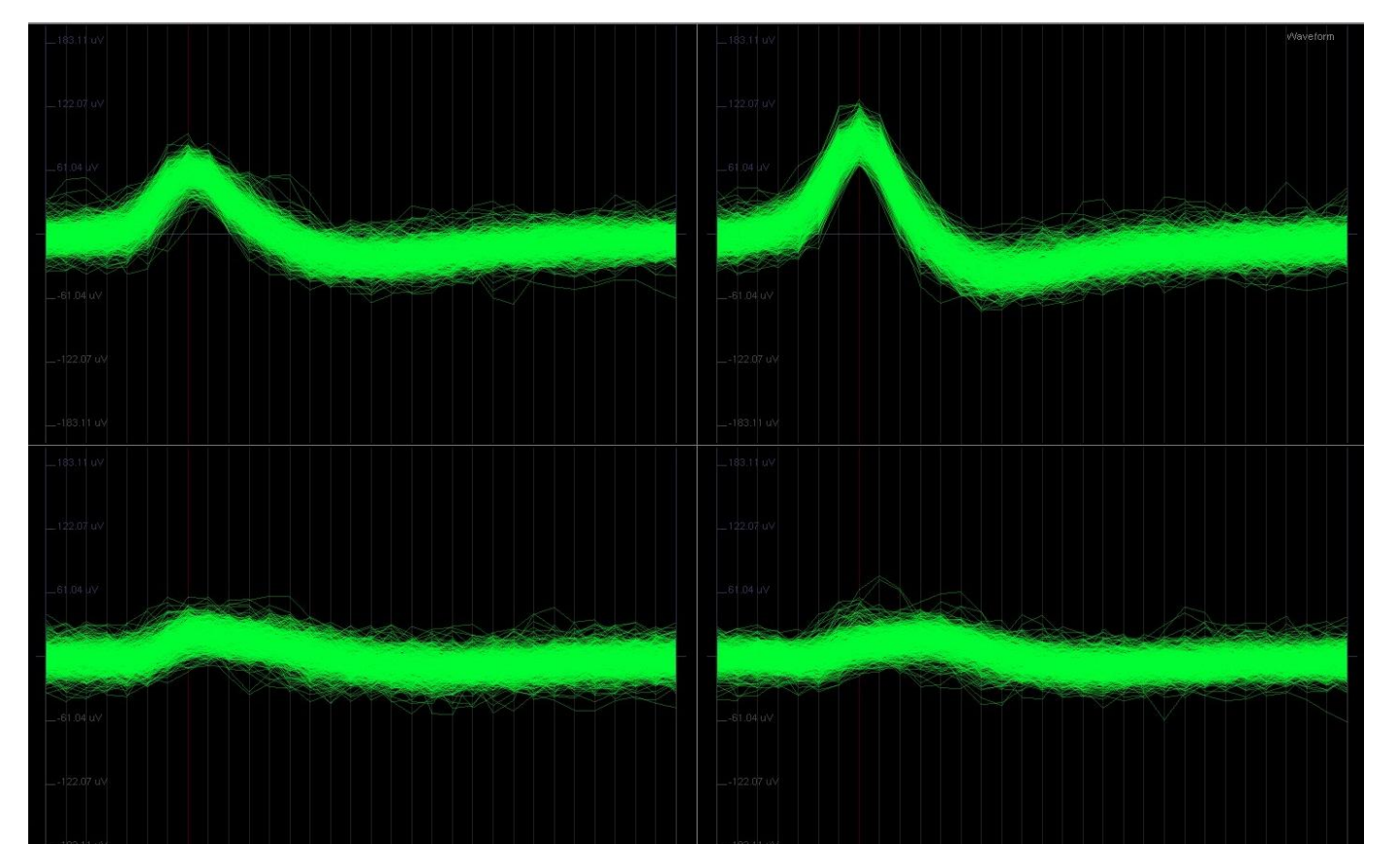
“Get-Ready” Cell Waveforms

“RIGHT-TURN” CELL (EGOCENTRIC)



This cell showed a far greater number of neuronal spikes prior to the end of delay during trials requiring a right turn (57) than those requiring a left turn (12). The consistent response indicates that the cell is selectively holding “right turn” information online across the delay period.

NOTE: Histograms shown differ in the scale of the y-axes.



Egocentric Cell Waveforms

CONCLUSIONS

- Cells in the PFC of the rat are observed to have discrete coding properties that can be correlated with event related behaviors.
- On going research is being conducted to further investigate these coding properties of neurons in rat PFC.

ACKNOWLEDGEMENTS

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