

Inter-species comparison of spike trains among cortical areas

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Abstract

The cytoarchitectonic subdivisions of the brain coincided with functional subdivisions, which are defined by the tuning characteristics of the component neurons for specific physiological functions, such as sensation, memory, association, or action. Because different organizations may bring about different dynamics, it seems plausible that neurons in different functional regions have different firing properties, whereas homologous regions across animal species might have firing patterns that are similar. To test this hypothesis, we searched for firing characteristics that are correlated to the functional subdivisions, using neuronal spike trains recorded from behaving mice, rats, cats, and macaque monkeys. The firing regularity differed systematically across functional regions; neuronal firing was consistently most regular in motor areas, nearly random in visual and prefrontal/medial prefrontal cortical areas, and bursting in the hippocampus in all animals we examined. Our finding suggests that different neuronal firing patterns enable efficient computations, depending on the types of information being carried.

Host: Hiro. Nakahara Lab for Integrated Theoretical Neuroscience