お茶の水ニューロサイエンス
アソシエーション（ONSA）

東京医科歯科大学 Tokyo Medical and Dental University
CBIR 脳統合機能研究センター

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Examination of hippocampal dynamics using Bayesian learning and optogenetics

演者

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日時

2023 年 7 月 11 日(火) 17:00-18:00

会場

ハイブリッド開催（対面＆オンライン）
【会場】M&D タワー　6 階　セミナー室 11
【オンライン配信】
Zoom：　https://zoom.us/j/92293458162
ミーティング ID: 922 9345 8162　パスコード: 902899

講演要旨

Recurrent connectivity between excitatory neurons and the strength of feedback from inhibitory neurons are critical determinants of the dynamics and computational properties of neuronal circuits. In the hippocampus, neuronal circuits generate spatial representations that undergo continuous refinement following formation during exploration. In this talk I will present two very different approaches towards a better understanding of the hippocampal circuitry and how it supports spatial memory. In the first part, I will present a novel Bayesian learning approach to track dynamically the spatial tuning of individual neurons during offline states in freely moving rats. This approach allows us to infer and characterize the retuning of place fields during offline periods, revealing the rapid emergence of representations following novel exploration and the active role of sleep in the representational dynamics of the hippocampus. In the second part of the talk, I will present work using optogenetic manipulations to probe hippocampal CA1 and CA3 regions in large-scale unit recordings in rats under anesthesia and in quiet waking. We find that both regions exhibit striking paradoxical responses to optogenetics: subsets of cells increase firing during photoinhibition, while other cells decrease firing during photoexcitation. These observations are explained by circuit models based on inhibition-stabilized networks, in which strong recurrent excitation is balanced by feedback inhibition. Our results highlight the often paradoxical circuit dynamics that are evidenced during optogenetic manipulations and indicate that contrary to long-standing dogma, both CA1 and CA3 hippocampal regions display strongly recurrent excitation which is stabilized through inhibition.

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