

Séminaire NEURO : Jean-Paul Banquet

20 Novembre 2018, 10:00

Titre du séminaire et orateur

Time, Sequences and Memory, the fourth dimension in the hippocampus.

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Date et lieu

Mardi 20 novembre 2018, 10h.

Site Saint Martin, salle 570 (5ème étage)

Summary

Our phenomenological experiences, and their internal representations are structured by the continuity of space and time, coupled with uni-directionality of time as we perceive it. Yet, no specific system dedicated to perceiving and processing time has been localized in our brains. The once-dominant model of a central oscillator providing a linear metric of time through the integration of periodic events seems to have been abandoned in favor of multiple systems relying on the internal dynamics of the corresponding neurons and/or network structures. Among these brain structures, the hippocampus holds a special niche because its time processing range ideally suits to the infra/suprasecond time scales of animal behavior. After the discovery of its pivotal position in spatial processing and navigation, its more recently revealed central role in temporal processing and organization displays a complex diversity; including timing *stricto sensu* as a measure of elapsing time; memory maintenance through delays as in working memory (WM); prospective and retrospective coding as a WM expansion of the present; and finally 'on-line' or 'off-line' preplay or replay during sequence learning, different stages of memory consolidation, and planning. At least two complementary mechanisms operate respectively at short and longer time scales. On the one hand, population oscillations act as pacemakers for the synchronisation and/or the ordering of neuron activations, through the process of phase precession, in particular. On the other hand, the temporal coordination of events takes place through synaptic interactions among and within cell assemblies akin to the phase sequence Hebbian concept. Experimental evidence will be reviewed and specifically designed mathematical models will suggest mechanistic interpretations of the observed phenomena. Hypotheses will be proposed concerning the relations of these processes to the formation and consolidation of the different types of memories.

