

Hippocampus - biological data

List of important papers for this tutorial. – still in construction

Colin Molter cmolter@brain.riken.jp

Laboratory for Dynamics of Emergent Intelligence, RIKEN Brain Science Institute, Japan

NB: This list is still in construction. If you feel that a paper should be added to this list, please send me a mail mentioning a link to the paper with a two lines summary. Thank you.

(Scoville and Milner, 1957): seminal paper showing the importance of the hippocampus for episodic memory. This report the famous case of the patient H.M. who lost most of its hippocampus after surgery.

(OKeefe and Dostrovsky, 1971): in rats, hippocampal neurons are well characterized as ‘place cells’ firing at specific locations in the environment, the place fields .

(Bliss and Lomo, 1973): neurophysiological evidences of LTP;

(OKeefe and Nadel, 1978): elaboration of the cognitive map theory;

(Levy and Steward, 1983): the temporal coding (in term of phase precession) of the behavioral sequence at the theta timescale is adequate for synaptic plasticity.

(Rank, 1985): Discovery of the head direction cells in the postsubiculum and the anterior thalamic nuclei (see also (Taube et al., 1990) for more quantitative results).

(Buzsáki, 1986),(Buzsáki, 1989): rat hippocampus exhibits two very distinctive temporal patterns of the local field potential: rhythmic theta oscillation (4-12 Hz) during exploratory behavior and REM sleep and large irregular transient burst of CA3–CA1 pyramidal cells associated with sharp waves (SPWs) during sleep and awake immobility.

(Bostock et al., 1991): the ability of hippocampal place cells to undergo remapping in response to small changes in environmental conditions;

(Squire, 1992): nice paper clarifying what are the different types of memory.

(OKeefe and Recce, 1993; Skaggs et al., 1996): when crossing a place field, the firing rate of place cells is modulated by theta oscillation of local field potential (LFP) in term of ‘theta phase precession’ : the relative firing phase unidirectionally shifts to earlier theta phases when the rat crosses a place field.

(Wilson and McNaughton, 1994): during SPWs, the activated cells are representative of previous behavioral activity.

(Jung et al., 1994): the ventral hippocampus is characterized by place cells with spatial selectivity.

(Kolb and Whishaw, 1996): based on the world famous patient HM (who lost part of its hippocampus after surgery), this book provides good insights on the importance of the hippocampus in memory formation.

(Cash and Yuste, 1998), (Gasparini and Magee, 2006): hippocampal neurons can perform linear summation of their inputs.

(Dolorfo and Amaral, 1998): mECII grid cells constitute the main source of inputs to the dentate gyrus (DG).

(Bi and Poo, 1999): asymmetric time window of synaptic plasticity;

(Csicsvari et al., 2000): quantitative information of CA3-CA1 hippocampal sharp waves.

(Fortin et al., 2002): nice paper showing the importance played by the hippocampus in memory of sequences and path navigation from lesioned rats.

(Pouille and Scanziani, 2001): due to a balance of inhibition, hippocampal pyramidal act as coincident detectors (2ms). Similarly, it has been shown that purkinje cells in the cerebellum acts also as coincident detectors (**Brunel et al., 2004**).

(Lee and Wilson, 2002): 1D experienced sequences of place cells are replayed in the same order but in a compressed time scale (~msec) during sleep SWS.

(Malkova and Mishkin, 2003): evidence from lesion studies of the important role played by the hippocampus in object place associations.

(Fyhn et al., 2004; Hafting et al., 2005): layer II-III cells of the medial entorhinal cortex (mEC), which mediate the majority of the cortical input to the hippocampus, have a different spatial pattern of activity; these cells, so-called 'grid cells', fire at several locations in any environment the animal visits, with the locations forming a regular triangular grid-like pattern.

(Zugaro et al., 2005): hippocampal phase precession persists after transient intrahippocampal perturbations resulting in a reset of the theta rhythm.

(O'Neill et al., 2006): sharp waves occur also during exploratory behavior, as a small part of theta cycles.

(Foster and Wilson, 2006): 1D experienced sequences of place cells are replayed in the reverse order but in a compressed time scale (~msec) during consummatory behavior SWS.

(Maurer et al., 2006): data suggesting that a single place cell may express multiple place fields partially overlapping.

(Hafting et al., 2006): theta phase precession is observed when the rat traverses any receptive field of a grid cell.

(Buzsáki, 2006): nice book discussing the different rhythms appearing in the hippocampus, their roles and their characteristics.

(Leutgeb et al., 2007): global remapping of the DG-CA3 place cells. Furthermore, the different regions of the trisynaptic hippocampal loop are characterized by different spatial representations: CA1 and CA3 place cells are characterized by the presence of unique place fields, and at the gate of the hippocampus, the dentate gyrus (DG) is characterized by a large number of place cells having two or more place fields, each field having similar size than the CA3 place fields.

(Fyhn et al., 2007): hippocampal global remapping could be predicted by a coherent realignment of the mEC grid fields.

(McHugh et al., 2007): the important role played by the NMDA receptors in the dentate cells for pattern separation

(Ge et al., 2007): synaptic plasticity is enhanced in newly generated neurons.

(Molter et al., 2008a): firing activity of place cells in their place fields are trajectory dependent. This poster aimed to test a computational hypotheses of the place field formation from the grid fields.

(Molter et al., 2008b): theta rhythm plays a major role in the rat hippocampus. This poster aims to show how this theta is slow modulated and how it affects the cells' firing properties.

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