

Title: Neural mechanisms of spatial cognition and episodic memory

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Abstract:

The discovery of place cells, grid cells, head-direction cells and boundary vector cells allows the construction of a neural level model of spatial memory, bridging from electrophysiology in behaving rodents to behaviour, neuroimaging and neuropsychology in humans. I will discuss this model and related experimental data, including how spatial representations combine environmental sensory information with self-motion, potential roles for theta rhythmicity, and how perception or imagery interacts with mnemonic representations in the hippocampus. Finally, I will discuss how a single coherent spatial representation might be formed, and how grid cells in entorhinal cortex might relate to imagery, memory and planning.

Related reading

Bicanski A, Burgess N (2016) Environmental anchoring of head direction in a computational model of retrosplenial cortex. *J Neurosci* 36 11601-18.

Carpenter F, Manson D, Jeffery K, Burgess N, Barry C (2015) Grid Cells Form a Global Representation of Connected Environments. *Curr. Biol.* 25: 1176-1182.

Horner AJ, Bisby JA, Bush D, Lin WJ, Burgess N (2015) Evidence for holistic episodic recollection via hippocampal pattern completion. *Nature Comms*, 6: 7462

Bush D, Burgess N (2014) A hybrid oscillatory interference / continuous attractor network model of grid cell firing. *J. Neurosci.*, 34: 5065-5079.

Burgess N, O'Keefe J (2011) Models of place and grid cell firing and theta rhythmicity. *Curr Opin. Neurobiol.* 21: 734-744.

Doeller CF, Barry C, Burgess, N (2010) Evidence for grid cells in a human memory network. *Nature* 463 657- 661.

Byrne P, Becker S, Burgess N (2007). Remembering the past and imagining the future: a neural model of spatial memory and imagery. *Psychological Review* 114 340-375.