

Evaluation of thalamo-hippocampal-frontal networks in recognition memory

Supervisory team:

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Project description:

Recognition memory lets us know whether something that we encounter in our lives, is new or familiar. The formation of such memory is very rapid and is usually taken for granted but it is essential for all our normal daily activities. Our research has shown that successful recognition memory depends on interactions between the hippocampus and cortex, but also involve additional interactions with the thalamus, specifically the nucleus reuniens which when damaged, as can happen during a stroke, results in poor memory function. However how memory information is processed within this hippocampo-thalamic-cortical circuit is not known.

The aim of this project is to examine the role of the neural connections between the hippocampus, nucleus reuniens and prefrontal cortex in recognition memory formation. To address our specific hypotheses this multidisciplinary project will use state-of-the-art optogenetic and pharmacogenetic techniques. Optogenetic technology enables us to bidirectionally manipulate neural activity over short timescales, using the local administration of light stimuli to neurons that express light sensitive membrane channels, while pharmacogenetic technologies allow us to manipulate neural activity over longer timescales. The effects of these specific neural manipulations will be tested using a combination of behavioural techniques to assess effects of memory, and neuroimaging and neuroanatomy to analyse neural circuitry and *in vitro* electrophysiological techniques to identify cellular mechanisms.

Warburton, Aggleton and Bashir have established track records investigating the neural basis of learning and memory. New students will join a multidisciplinary research team comprising PhD students, postdoctoral researchers and technical staff who apply both *in vivo* and *in vitro* techniques to uncovering the neural basis of learning and memory hence students will gain valuable training in multidisciplinary approaches to understanding memory processes.

The insights from this research will ultimately help in understanding memory loss that occurs during aging, in dementia and following a stroke.