

IN BRIEF

SPATIAL AWARENESS

Neural correlates of virtual route recognition in congenital blindness

Kupers, R. *et al. Proc. Natl Acad. Sci. USA* 28 Jun 2010 (doi:10.1073/pnas.1006199107)

Individuals who are affected by congenital blindness retain the ability to navigate a space based on non-visual cues, but whether they make use of the same brain areas as sighted individuals is unknown. In this study, the authors trained individuals with congenital blindness to perform a virtual navigation task using a tongue display unit — a tactile-to-vision sensory substitution device — and measured their brain activation patterns using functional MRI. Subjects who are blind showed activation of the parahippocampus and visual cortex, suggesting that they recruit the same cortical network that is used by sighted subjects for spatial navigation.

NEUROIMAGING

Global and local fMRI signals driven by neurons defined optogenetically by type and wiring

Lee, J. H. *et al. Nature* **465**, 788–792 (2010)

Blood oxygenation level-dependent functional MRI (BOLD fMRI) has increasingly been used as a method for non-invasive whole-brain imaging, but whether BOLD signals reflect local neuronal excitation remains controversial. By combining high-field fMRI with optogenetics, the authors of this study showed that optical stimulation of neurons expressing an exogenous rhodopsin triggered a robust local signal with similar dynamics to conventional stimulus-evoked BOLD fMRI. This provides an empirical validation for the use of BOLD fMRI.

ADDICTION

Transition to addiction is associated with a persistent impairment in synaptic plasticity

Kasanetz, F. *et al. Science* **328**, 1709–1712 (2010)

Transition to addiction is defined as the loss of control over the consumption of drugs of abuse, but the biological basis of this shift is largely unknown. Here, the authors measured the persistence of cocaine-seeking in rats after prolonged self-administration to identify those that had become addicted. In contrast to non-addict rats, these rats failed to recover from the temporary impairment in NMDA (*N*-methyl-D-aspartate) receptor-dependent long-term depression induced by self-administration of the drug. These results suggest that the inability to modulate synaptic inputs based on external cues may prevent addicts from learning to control their drug intake.

NEURONAL PLASTICITY

Activity-dependent relocation of the axon initial segment fine-tunes neuronal excitability

Grubb, M. S. & Burrone, J. *Nature* **465**, 1070–1074 (2010)

The axon initial segment (AIS) is a subcellular structure that is present in neurons, and from which action potentials arise. Here, the authors show that chronic depolarization can temporarily alter the location of the AIS in hippocampal neurons. The relocation of the AIS resulted in increased thresholds for action potential spiking. This novel mechanism of activity-dependent plasticity may be used by neurons to fine-tune their excitability during the development of functional networks.