IN BRIEF

ADDICTION

The binding sites for cocaine and dopamine in the dopamine transporter overlap

Beuming, T. *et al. Nature Neurosci.* **11**, 780–789 (2008)

Cocaine is thought to inhibit the dopamine transporter (DAT), but how it interacts with DAT has remained unknown. The authors developed a molecular model of DAT based on a bacterial DAT homologue. The model revealed overlapping binding sites for dopamine and the cocaine homologue CFT in the centre of DAT, suggesting that cocaine and dopamine compete for DAT binding and that increased synaptic dopamine levels will result from cocaine consumption. This finding indicates that cocaine-addiction treatments based on competitive inhibition of cocaine binding to DAT would probably be ineffective.

SPATIAL PROCESSING

Finite scale of spatial representation in the hippocampus

Kjelstrup, K. B. *et al. Science* **321**, 140–143 (2008)

Place cells fire when an animal is in a position in the environment that corresponds to the cells' place field. They were thought to be exclusive to the dorsal hippocampus. However, this study shows that the ventral hippocampus also contains place cells. The authors determined, in rats running along a linear track, the place fields of neurons along the dorsoventral axis of the hippocampus. Place fields increased in size from the dorsal (~1 m) to the ventral (~10 m) pole, indicating that the hippocampus can process space at different scales and levels of detail.

STRESS RESPONSE

Aging impairs the unfolded protein response to sleep deprivation and leads to proapoptotic signaling

Naidoo, N. *et al. J. Neurosci.* **28**, 6539–6548 (2008)

In response to stress (such as acute sleep deprivation) and the accumulation of misfolded proteins that stress causes, young animals activate what is known as the unfolded-protein response. This response, which involves the upregulation of chaperone proteins and the attenuation of protein translation, has now been found to be defective in aged animals. Following sleep deprivation, an increase in pro-apoptotic factors is observed in the cortex in these animals, suggesting that their ability to manage protein misfolding declines with age.

SENSORY SYSTEMS

cAMP signalling in mushroom bodies modulates temperature preference behaviour in *Drosophila*

Hong, S. -T. *et al. Nature* 29 Jun 2008 (doi:10.1038/nature07090)

Unlike mammals, which regulate their body temperature through sweating and changing their metabolic rate, flies must continuously move to places with an environmental temperature that matches their ideal body temperature. Now, the mechanisms and brain regions involved in this temperature-preference behaviour (TPB) have been identified in *Drosophila melanogaster*. The authors show that the cyclic AMP (cAMP)-dependent protein kinase A (cAMP–PKA) pathway in mushroom body (MB) cells is essential for controlling TPB. MB cells are known to be involved in learning, suggesting that the process of sensing and interpreting temperature could share mechanisms with learning and memory.