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IN BRIEF

SENSORY PROCESSING

The eyes have it

Direction selectivity is an important part of motion detection. Direction-selective cells have been found both in the retina and in their projection target, the superior colliculus (SC), but precisely where and how direction selectivity arises is not well understood. By optogenetically manipulating specific direction-selective retinal ganglion cells (RGCs) and monitoring the effects on their target SC neurons, the authors determined that direction selectivity arises in the retina and that SC neurons exhibit direction selectivity as a result of receiving converging inputs from similarly tuned RGCs.

ORIGINAL ARTICLE Shi, X. *et al.* Retinal origin of direction selectivity in the superior colliculus. *Nat. Neurosci.* http://dx.doi.org/10.1038/nn.4498 (2017)

NEURAL DEVELOPMENT

Digit development

The specification of the motor neuron subtypes that innervate digits is not well understood. Limb-innervating motor neuron specification is influenced by retinoic acid, the synthesis of which is regulated by specific expression patterns of homeobox (HOX) transcription factors and their cofactor FOXP1 (forkhead box protein P1). The authors found that, unlike limb-innervating neurons, digit-innervating motor neurons express a distinct set of Hox genes and, unexpectedly, are insensitive to retinoic acid. This distinction might reflect a specialization that occurred during the evolutionary emergence of digits and their role in skilled motor behaviour.

ORIGINAL ARTICLE Mendelsohn, A. I., Dasen, J. S. & Jessell, T. M. Divergent Hox coding and evasion of retinoid signaling specifies motor neurons innervating digit muscles. *Neuron* http://dx.doi.org/10.1016/j.neuron.2017.01.017 (2017)

SLEEP

Gaining sleep while losing synapses

It has been suggested that synaptic weakening occurs during sleep to counterbalance daytime synaptic strengthening. The authors found that sleep was associated with a reduction in the level of postsynaptic AMPA receptors compared with awake periods, indicating homeostatic scaling down. The mechanism involves expression of the transcription factor HOMER1A; during the day, HOMER1A expression increases at non-synaptic locations, but at sleep onset the protein is recruited to the postsynaptic density, where it drives AMPA receptor removal and synaptic weakening.

ORIGINAL ARTICLE Diering, G. H. *et al.* Homer1a drives homeostatic scaling-down of excitatory synapses during sleep. *Science* **355**, 511–515 (2017)

SYNAPTIC PLASTICITY

Kainate receptors can LTP

Classical synaptic long-term potentiation (LTP) requires NMDA receptor (NMDAR) activation, which drives AMPA receptor (AMPAR) insertion into the postsynaptic membrane. Here, activation of kainate receptors (KARs) in rat CA1 neurons triggered an increase in postsynaptic AMPAR surface expression and potentiated AMPAR-mediated CA1 excitatory postsynaptic responses. These changes were independent of NMDAR activation and required KAR-mediated metabotropic signalling via G-protein-dependent increases in intracellular Ca^{2+}, protein kinase C activation, and increased recruitment of recycling endosomes.

ORIGINAL ARTICLE Petrovic, M. M. *et al.* Metabotropic action of postsynaptic kainate receptors triggers hippocampal long-term potentiation. *Nat. Neurosci.* http://dx.doi.org/10.1038/nn.4505 (2017)