

IN BRIEF

NEUROTRANSMITTER RECEPTORS

Splicing up synaptic strength

Neurexins, which are presynaptic cell adhesion molecules, have multiple alternatively spliced forms, but why this splicing is needed is unclear. Aoto *et al.* created mice that constitutively expressed a variant of neurexin 3 that includes alternatively spliced sequence 4 (NRX3^{SS4+}) and in which SS4 could be excised by Cre recombination. NRX3^{SS4+} expression decreased postsynaptic AMPA receptor levels in neurons and impaired long-term potentiation in hippocampal slices. SS4 excision rescued these effects, suggesting that NRX3 alternative splicing may trans-synaptically regulate AMPA receptor trafficking and synaptic strength.

ORIGINAL RESEARCH PAPER Aoto, J. *et al.* Presynaptic neurexin-3 alternative splicing trans-synaptically controls postsynaptic AMPA receptor trafficking. *Cell* **154**, 75–88 (2013)

SENSORY PROCESSING

Parallel paths

In the standard view of sensory processing, information is conveyed from the thalamus to cortical layer 4 (L4), L2/3 and then L5/6. In a new study in rats, barrel cortex whole-cell recordings showed that postsynaptic potentials with similar latencies occurred in L4 and many L5/6 neurons after whisker stimulation, and paired *in vivo* recordings revealed that thalamocortical neurons may directly synapse onto L5 neurons. Moreover, lidocaine-induced suppression of L4 activity did not affect L5/6 sensory-evoked activity. Thus, in sensory processing, the thalamus may activate parallel cortical pathways.

ORIGINAL RESEARCH PAPER Constantinople, C. M. & Bruno, R. M. Deep cortical layers are activated directly by thalamus. *Science* **340**, 1591–1594 (2013)

BEHAVIOURAL NEUROSCIENCE

Promoting the interspecies divide

Interspecies mating is rare even in closely related species, but how this is prevented is unclear. Here, ablation of chemosensory neurons expressing the chemoreceptor Gr32a in male *Drosophila melanogaster* caused these flies to initiate courtship with females from their own and other drosophilid species. Similar effects were seen in male *D. melanogaster* expressing a mutated form of male-specific Fruitless (Fru^M), which regulates courtship behaviour. Notably, Gr32a neurons were found to synapse onto Fru^M neurons, suggesting the basis of a circuit that prevents male flies from courting females of another species.

ORIGINAL RESEARCH PAPER Fan, P. *et al.* Genetic and neural mechanisms that inhibit *Drosophila* from mating with other species. *Cell* **154**, 89–102 (2013)

NEURONAL CIRCUITS

Deciphering striatal innervation

The direct and indirect striatal pathways act in opposition to each other to regulate motor learning. They comprise different classes of medium spiny neuron (MSN), but it is unclear whether these classes are differentially innervated by other brain areas. Using a monosynaptic rabies virus system, Wall *et al.* found that some brain areas, such as the motor cortices, preferentially innervated the indirect pathway, whereas others, such as the limbic regions, preferentially innervated the direct pathway. Together, these 'maps' indicate that information segregation can occur above the level of MSNs.

ORIGINAL RESEARCH PAPER Wall, N. R. *et al.* Differential innervation of direct- and indirect-pathway striatal projection neurons. *Neuron* <http://dx.doi.org/10.1016/j.neuron.2013.05.014> (2013)