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IN BRIEF

LEARNING AND MEMORY

Early warning

During fear conditioning, animals learn to associate a previously neutral sensory stimulus, such as a particular odour (termed the conditioned stimulus), with an aversive experience (typically a footshock). Such fear learning alters processing in higher brain regions, but little is known about its impact on the sensory neurons that provide the initial input to sensory pathways. Here, the authors show that fear conditioning enhances the synaptic output of olfactory sensory neurons that is evoked by the conditioned stimulus. Thus, plasticity occurs at the first stage of sensory processing and may act to increase an animal's sensitivity to threat-predictive stimuli.

ORIGINAL RESEARCH PAPER Kass, M. D. *et al.* Fear learning enhances neural responses to threat-predictive sensory stimuli. *Science* **342**, 1389–1392 (2013)

SYNAPTOGENESIS

Synapse specializations

There is enormous diversity in the morphology and functional properties of synapses in the nervous system; however, we know little about the molecular pathways that direct the development of particular synaptic specializations. The authors show that expression of the transcription factor MAFB in spiral ganglion neurons (SGNs) is critical for the final stages of differentiation of the highly specialized ribbon synapses that form between cochlear hair cells and SGNs. They further show that MAFB acts downstream of the transcription factor GATA3 and that restoration of MAFB levels is able to rescue synapse defects that result from *Gata3* mutations.

ORIGINAL RESEARCH PAPER Yu, W.-M. *et al.* A Gata3–Mafb transcriptional network directs post-synaptic differentiation in synapses specialized for hearing. *eLife* **2**, e01341 (2013)

NEURAL REPAIR

Obstacles to growth for older axons

The speed at which peripheral neurons regenerate their axons after an injury declines with age; however, the underlying causes of this slow-down are unknown. Using time-lapse imaging, the authors reveal that regenerating axons encounter, and must bypass, physical 'obstacles' that are composed mainly of debris from degenerating axons and myelin. The clearance of this debris was slower in older animals, resulting in a slower overall pace of regeneration.

ORIGINAL RESEARCH PAPER Kang, H. & Lichtman, J. W. Motor axon regeneration and muscle reinnervation in young adult and aged animals. *J. Neurosci.* **33**, 19480–19491 (2013)

EMOTION

Ups and downs of glucocorticoids

Levels of circulating glucocorticoids oscillate in a circadian manner, but the importance of these rhythmic fluctuations in hormone levels is unknown. The authors here show that the amplitude of glucocorticoid oscillations is increased in female mice with subcapsular cell hyperplasia (SCH) of the adrenal gland. These mice exhibit reduced anxiety-related behaviour, an effect that is dependent on the increased glucocorticoid oscillations. They further show that SCH cells secrete intermediate opioid peptides that bind to the chemokine receptor CXCR7 (also known as ACKR3) in the adrenal glands to boost glucocorticoid oscillations. Thus, circadian glucocorticoid oscillations are involved in the regulation of emotional behaviour.

ORIGINAL RESEARCH PAPER Ikeda, Y. *et al.* Modulation of circadian glucocorticoid oscillation via adrenal opioid-CXCR7 signaling alters emotional behavior. *Cell* **155**, 1323–1336 (2013)